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ABSTRACT

The United States Training and Employment Service General Aptitude Test Battery (GATB), first published in 1947, has been included in a continuing program of research to validate the tests against success in many different occupations. The GATB consists of 12 tests which measure nine aptitudes: General Learning Ability; Verbal Aptitude; Numerical Aptitude; Spatial Aptitude; Form Perception; Clerical Perception; Motor Coordination; Finger Dexterity; and Manual Dexterity. The aptitude scores are standard scores with 100 as the average for the general working population, and a standard deviation of 20. Occupational norms are established in terms of minimum qualifying scores for each of the significant aptitude measures which, when combined, predict job performance. Cutting scores are set only for those aptitudes which aid in predicting the performance of the job duties of the experimental sample. The GATB norms described are appropriate only for jobs with content similar to that shown in the job description presented in this report. A description of the validation sample is also included. (AG)

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U.S. Training and
Employment Service
Technical Report
S-160

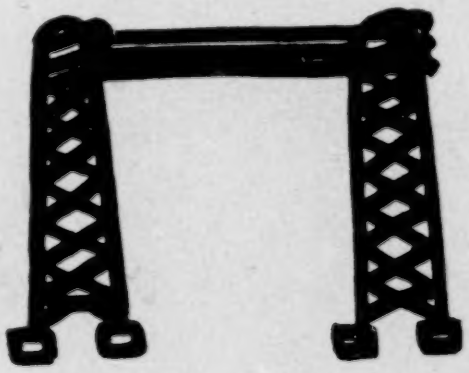
Development of USTES

APTITUDE TEST
BATTERY FOR

CABLE MAKER

(elec. equip.; electronics)
726.884

U S DEPARTMENT OF LABOR
Manpower Administration



TM 001 592

Technical Report on Development of USTES Aptitude Test Battery

For . . .

Cable Maker (elec. equip.; electronics) 726.884

S-160

(Developed in Cooperation with the New York
and Pennsylvania State Employment Services)

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U. S. Department of Labor
Manpower Administration

February 1970

FOREWORD

The United States Training and Employment Service General Aptitude Test Battery (GATB) was first published in 1947. Since that time the GATB has been included in a continuing program of research to validate the tests against success in many different occupations. Because of its extensive research base the GATB has come to be recognized as the best validated multiple aptitude test battery in existence for use in vocational guidance.

The GATB consists of 12 tests which measure 9 aptitudes: General Learning Ability, Verbal Aptitude, Numerical Aptitude, Spatial Aptitude, Form Perception, Clerical Perception, Motor Coordination, Finger Dexterity, and Manual Dexterity. The aptitude scores are standard scores with 100 as the average for the general working population, with a standard deviation of 20.

Occupational norms are established in terms of minimum qualifying scores for each of the significant aptitude measures which, in combination, predict job performance. For any given occupation, cutting scores are set only for those aptitudes which contribute to the prediction of performance of the job duties of the experimental sample. It is important to recognize that another job might have the same job title but the job content might not be similar. The GATB norms described in this report are appropriate for use only for jobs with content similar to that shown in the job description included in this report.

GATB Study Nos. 2233, 2408

DEVELOPMENT OF USTES APTITUDE TEST BATTERY

For

Cable Maker (elec. equip.; electronics) 726.884-018

S-160

This report describes research undertaken for the purpose of developing General Aptitude Test Battery (GATB) norms for the occupation of Cable Maker (elec. equip.; electronics) 726.884-018. The following norms were established:

GATB Aptitudes	Minimum Acceptable GATB Scores
G - General Learning Ability	90
P - Form Perception	85
Q - Clerical Perception	90
F - Finger Dexterity	80

RESEARCH SUMMARY-VALIDATION SAMPLE

Sample: 70 male workers employed as Cable Makers in New York. This study was conducted prior to the requirement of providing minority group information. Therefore, minority group composition is unknown.

Criterion: Supervisory ratings.

Design: Concurrent (test and criterion data were collected at approximately the same time).

Minimum aptitude requirements were determined on the basis of a job analysis and statistical analyses of aptitude mean scores, standard deviations, aptitude-criterion correlations, and selective efficiencies.

Concurrent Validity: Phi Coefficient = .44 ($P/2 < .0005$)

Effectiveness of Norms: Only 66% of the non-test-selected workers used for this study were good workers: if the workers had been test-selected with the above norms, 85% would have been good workers. Thirty-four percent

of the non-test selected workers used for this study were poor workers: if the workers had been test selected with the above norms, only 15% would have been poor workers. The effectiveness of the norms is shown graphically in Table 1:

TABLE 1

	Effectiveness of Norms Without Tests	With Tests
Good Workers	66%	85%
Poor Workers	34%	15%

SAMPLE DESCRIPTION

Size: N = 70

Occupational Status: Employed workers

Work Setting: Workers were employed at Cadre Industrial Corporation, Endwell, New York

Employer Selection Requirements:

Education: None required

Previous experience: None required

Tests: None used

Principal Activities: The job duties for each worker are comparable to those shown in the Appendix.

Minimum Experience: Workers in the sample had at least seven months job experience.

TABLE 2

Means, Standard Deviations, Ranges, Pearson Product-Moment Correlations with the Criterion (r) for Age, Education and Experience

	Mean	SD	Range	r
Age (years)	26.1	5.6	19-42	-.214
Education (years)	11.0	1.8	5-14	.205
Experience (months)	20.2	10.4	7-68	.277*

*Significant at the .05 level

Experimental Test Battery

All 12 tests of the GATB, B-1002A, were administered during May, 1958.

Criterion

The criterion for this study consisted of combined rank order ratings made by the administrative assistant who had been in a position where he indirectly supervised all the men in the sample. The ratings were based on versatility of job performance. Three foremen made ratings for workers under their supervision, and reratings were made two weeks later by the same foremen. The method used by the administrative assistant to merge the ratings was to consider the foremen's ratings as a guide in assigning ranks and then rank the workers in accordance with his own judgment. This method was applied to each of the foreman groups separately. The administrative assistant then combined the three foreman groups on an overall basis in accordance with his own judgment. The final criterion consisted of rank order ratings converted to linear scores.

Criterion Score Distribution:

Range	:	6-94
Mean	:	50.0
Standard Deviation:		18.1

Criterion Dichotomy:

The criterion distribution was dichomotized into low and high groups by placing 34% of the sample in the low group to correspond with the percentage of workers considered unsatisfactory or marginal. Workers in the high group were designated as "good workers" and those in the low group as "poor workers". The criterion critical score is 41.

Aptitudes Considered for Inclusion in the Norms

Aptitudes were selected for tryout in the norms on the basis of a qualitative analysis of job duties involved and a statistical analysis of test and criterion data. Tables 3, 4, and 5 show the results of the qualitative and statistical analyses.

TABLE 3

Qualitative Analysis
(Based on the job analysis, the aptitudes indicated appear to be important to the work performed.)

Aptitude	Rationale
G - General Learning Ability	Required to identify and follow procedures for a wide variety of wiring processes.
P - Form Perception	Required to interpret the design of the schematic diagram for each cable to distinguish wiring order and size, and to follow schematic diagram properly in wiring boards.
K - Motor Coordination	Required for eye-handcoordination and motor speed needed in wiring and sewing operations.
F - Finger Dexterity M- Manual Dexterity	Required in handling wires and in the tasks involving placement of materials; also required in cutting wires with pliers and shears and in using the large needle in sewing operation.

TABLE 4

Means, Standard Deviations (SD), Ranges and Pearson Product-Moment Correlations with the Criterion (r) for the Aptitudes of the GATB

	Mean	SD	Range	r
G - General Learning Ability	101.5	14.1	67-138	.292*
V - Verbal Aptitude	96.5	12.7	70-133	.177
N - Numerical Aptitude	100.9	16.2	55-143	.335**
S - Spatial Aptitude	103.7	16.2	58-140	.161
P - Form Perception	99.8	18.0	66-150	.300*
Q - Clerical Perception	100.2	13.7	67-131	.391**
K - Motor Coordination	100.9	17.8	58-140	.398**
F - Finger Dexterity	96.9	17.1	54-143	.240*
M- Manual Dexterity	105.9	16.4	59-142	.023

* Significant at the .05 level
**Significant at the .01 level

TABLE 5

Summary of Qualitative and Quantitative Data

Type of Evidence	Aptitudes								
	G	V	N	S	P	Q	K	F	M
Job Analysis Data									
Important	X				X		X	X	X
Irrelevant									
Relatively High Mean	X						X		X
Relatively Low Standard Deviation	X	X				X			
Significant Correlation with Criterion	X				X	X	X	X	X
Aptitudes to be Considered for Trial Norms	G				P	Q	K	F	M

DERIVATION AND VALIDITY OF NORMS

Final norms were derived on the basis of a comparison of the degree to which trial norms consisting of various combinations of aptitudes G, P, Q, K, F, M at trial cutting scores were able to differentiate between the 66% of the sample considered good workers and the 34% of the sample considered poor workers. Trial cutting scores at five-point intervals approximately one standard deviation below the mean are tried because this will eliminate about one-third of the sample with three-aptitude norms. For two-aptitude norms, minimum cutting scores slightly higher than one standard deviation below the mean will eliminate about one-third of the sample; for four-aptitude trial norms, cutting scores slightly lower than one standard deviation below the mean will eliminate about one-third of the sample. The Phi Coefficient was used as the basis for comparing trial norms. The optimum differentiation for the occupation of Cable Maker (elec. equipment; electronics) 726.884-018 was provided by norms of G-90, P-85, Q-90, and F-80. The validity of these norms is shown in Table 6 and is indicated by a Phi Coefficient of .44 (statistically significant at the .0005 level).

Concurrent Validity of Test Norms
G-90, P-85, Q-90 and F-80

	Nonqualifying Test Scores	Qualifying Test Scores	Total
Good Workers	12	34	46
Poor Workers	18	6	24
Total	30	40	70

Phi Coefficient (ϕ) = .44 Chi Square (X^2_y) = 13.5
Significance Level = $P/2 < .0005$

DETERMINATION OF OCCUPATIONAL APTITUDE PATTERN

The data for this study met the requirement for incorporating the occupation studied in OAP-24 which is shown in the 1970 edition of Section II of the Manual for the General Aptitude Test Battery. A Phi Coefficient of .31 is obtained with the OAP-24 norms of G-80,P-85, Q-90.

CHECK STUDY RESEARCH SUMMARY SHEET

S-160 GATB #2408

Cable Maker (elec. equip.; electronics) 726.884-018

Check Study #1 Research Summary

Sample: Thirty female workers employed as Cable Makers by JPM Manufacturing Company, Lewisburg, Pennsylvania. This study was completed prior to the requirement of providing minority group composition. Therefore, minority group composition is unknown.

TABLE 7

Means, Standard Deviations, Ranges, Pearson Product-Moment Correlations with the Criterion (r) for Age, Education, Experience, and Aptitudes of the GATB-Cross Validation Sample #1.

	Mean	SD	Range	r
Age (years)	26.7	8.6	18-48	.159
Education (years)	11.7	1.1	8-15	.491**
Experience (months)	4.9	3.9	1-16	.807**
G-General Learning Ability	98.1	17.0	65-134	.580**
V-Verbal Aptitude	97.0	15.8	76-131	.363*
N-Numerical Aptitude	100.0	16.0	70-136	.610**
S-Spatial Aptitude	100.2	16.9	68-137	.452*
P-Form Perception	111.7	17.5	58-144	.288
Q-Clerical Perception	109.9	14.3	66-139	.540**
K-Motor Coordination	112.5	17.7	55-144	.417*
F- Finger Dexterity	112.7	17.6	79-149	.066
M-Manual Dexterity	120.3	19.4	91-175	.223

*Significant at the .05 level
**Significant at the .01 level

Criterion: Supervisory ratings. Criterion collected in 1962.

Design: Concurrent (test and criterion data were collected at approximately the same time.)

Principal Activities; The job duties for this sample are comparable to those shown in the job description in the Appendix.

Concurrent Validity: Phi Coefficient = .63 ($P/2 < .0005$)

Effectiveness of Norms: Only 63% of the nontest-selected workers used for this study were good workers; if the workers had been test-selected with the S-160 norms, 86% would have been good workers. Thirty-seven percent of the nontest-selected workers used for this study were poor workers; if the workers were test-selected with the S-160 norms, only 24% would have been poor workers. The effectiveness of the norms is shown graphically in Table 8.

TABLE 8

Effectiveness of S-160 Norms on Check Study #1 Sample

	Without Tests	With Tests
Good Workers	63%	86%
Poor Workers	37%	24%

TABLE 9

Concurrent Validity of S-160 Norms
(G-90,P-85,Q-90 and F-80) on Check Study #1 Sample

	Nonqualifying Test Scores	Qualifying Test Scores	Total
Good Workers	1	18	19
Poor Workers	8	3	11
Total	9	21	30

Phi Coefficient (ϕ) = .63 Chi Square (X^2_y) = 12.1
Significance Level = P/2 $<$ .0005

FACT SHEET

Job Title: Cable Maker (elec. equipment; electronics), 726.884-018

Job Summary: Makes cables for circuitry of electronic data processing machines, by stringing insulated copper wire around nails, arranged according to a schematic diagram on a cable board, and laces bunched wires tightly together to form cable body and leads.

Work Performed: Receives cable-winding assignment and obtains work materials: Selects properly numbered cable board (board ranges in size from 2' X 5' to $4\frac{1}{2}$' by 10' and weigh as much as two hundred pounds) from storage rack and aided by another worker or workers, carries board to work station, placing it in tilted upright position on easel type fixture. Notes wiring order, wire size, and color requirements data listed on cable board, secures from stock shelves and mounts spools of wire on wire rack spindles adjacent to cable board.

Winds cables: Pulls designated wire off spool, strings and loops it tightly around numbered pins moving back and forth in front of cable board; cuts wire with plier-like shears as each circuit is completed, and changes from one to another size or color of wire as specified by written instructions until all wires are in place.

Sews bunched wires on board into cable: Cuts off several feet of heavy, waxed twine or flat nylon cord from spool, and threads curved needle similar to an upholsterer's needle, shaped like a half-circle, about six inches in length around the curve; passes needle around large body of wire and sews or laces wire tightly into round cable with lock stitches, spaced and tied according to specifications; re-threads needle from time to time and continues sewing, working toward smaller sections and branches until cable is completely laced.

Removes cable from board: Attaches identifying tag to cable. Clips off loops of wire around pins, thus forming leads from cable body; pulls sewed (laced) cable off pins and board, drops it into work box and makes tally mark on production record sheet.

Effectiveness of Norms: Only 66% of the nontest-selected workers in the validation study were good workers; if the workers had been test-selected with the S-160 norms, 85% would have been good workers. Thirty-four percent of the nontest-selected workers used for this study were poor workers; if the workers had been test-selected with the S-160 norms, only 15% would have been poor workers.

Only 63% of the nontest-selected workers in Check Study No. 1 were good workers; if the workers had been test-selected with the S-160 norms, 86% would have been good workers. Thirty-seven percent of the nontest-selected workers used for this study were poor workers; if the workers had been test-selected with the S-160 norms, only 24% would have been poor workers.

Applicability of S-160 Norms: The aptitude test battery is applicable to jobs which include a majority of the duties described above.

GPO 898.801